BREEDING BIRD SURVEY OF THE WHITEFISH STATION AREA, MacKENZIE DELTA, 1985

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J. Hawkings

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ABSTRACT

Breeding birds of the Whitefish Station area, MacKenzie Delta, were studied from 19 June to 3 July 1985. Densities of birds and nests were determined from ground censuses of six 10 ha plots. A total of 206 nests of 16 species were found. Of these, 38 nests of 12 species were on the study plots. The mean nest density on the plots was 61.7/km^2., of which 28.3/km^2 were shorebirds, 20.0km^2 were passerines, and 8.3^2 were ducks. The most common nests found on plots were of semipalmated sandpipers, red-necked phalaropes, lapland longspurs, and savannah sparrows. Mean bird density on the plots was 311.7/km^2, with the most species savannah sparrow, lapland longspur, semipalmated sandpiper, and red-necked phalarope. Several mixed colonies of nesting glaucous gulls and brant were inventoried (total 78 glaucous gull and 56 brant nests). The relationship of the Whitefish Station avifauna to that of adjacent areas is discussed, and species accounts are provided for all birds seen during the study.

RÉSUMÉ

Du 19 juin au 3 juillet 1985 on a étudié les oiseaux et leur nidification dans le secteur de la station de Whitefish, dans le delta du Mackenzie. Pour ce faire on a eu recours à différentes méthodes d'observation dont l'une a porté sur six parcelles de 10 ha chacune. Dans les six parcelles évoquées ci-dessus on a évalué les densités des oiseaux et des nids au moyen de dénombrements. Sur les 206 nids dénombrés par les différentes méthodes et provenant de 16 espèces différentes, 38 provenant de 12 espèces différentes ont été trouvés dans les six parcelles. La densité moyenne de ces derniers était de 61,7/km^2, dont 28,3/km^2 pour les oiseaux littoraux, 20/km^2 pour les passereaux et 8,3/km^2 pour les canards. Les nids les plus couramment trouvés dans les parcelles appartenaient aux bécasseaux semi-palmés, aux phalaropes à bec étroit, aux bruants lapons et aux pinsons des prés. La densité moyenne des oiseaux dénombrés dans les parcelles était de 311,7/km^2, les espèces les plus courantes étant le pinson des prés, le bruant lapon, le bécasseau semi-palmé et la phalarope à bec étroit. On a inventorié plusieurs colonies mixtes de goélands bourgmestres et de bernaches (en tout 78 nids de goélands bourgmestres et 56 nids de bernaches). Le rapport compare l'avifaune de la station de Whitefish et celle des zones adjacentes et rend compte des espèces auxquelles appartiennent tous les oiseaux relevés au cours de l'étude.

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1.0 INTRODUCTION

The Yukon portion of the Mackenzie Delta is one of two Yukon wetland areas listed as critical and having international importance in the North American Waterfowl Management Plan (Canadian Wildlife Service and U. S. Fish and Wildlife Service 1985). Many important wetland areas in the Yukon north slope region are included in the new Northern Yukon National Park as part of the Inuvialuit Final Agreement (Indian and Northern Affairs Canada 1984), and are thus afforded increased protection from the effects of development. The portion of the Yukon north slope which is not included in the national park is identified in the Agreement (Section 12(20)) as an area where controlled development may take place subject to an environmental screening and review process. Much of this development is likely to be related to oil and gas exploration and production in the Beaufort Sea. The Beaufort Sea Environmental Assessment Panel recommended that the Canadian Wildlife Service continue its inventories and research on the birds most likely to be affected by this development.

Of the north slope wetlands, the Yukon portion of the Mackenzie Delta is the one most used by hunters and the one most intensively used by breeding and staging migratory birds (Koski 1977b, Martell et al. 1984:80, Smyth et al. 1986). The Inuvialuit Final Agreement stipulates (Section 12(41)) that "within their respective jurisdictions, governments shall determine the harvestable quotas for wildlife species based on the principles of conservation...." Basic data on migratory bird habitat, populations, and harvest for this area are necessary in order to satisfy the requirements of the Agreement and to conform to the North American Waterfowl Management Plan. So far, relatively little effort has been put into obtaining these data. Campbell (1973) studied the breeding biology of birds in the Moose Channel area and conducted aerial surveys primarily for swans. However, he did not provide estimates of nesting density for most birds. Hogg et al. (1986) conducted a ground census of birds and classified coastal habitat on the eastern portion of the Blow River Delta in late July 1981, and a number of other studies have included aerial surveys of parts of the area (eg. Calef and Lortie 1971, Koski and Gollop 1974, Schweinsburg 1974, Koski 1975b, 1977a, 1977b, Wiseley et al. 1977). Most of these aerial surveys have been part of fall migration and staging studies of geese and swans.

The objective of this study was to determine species composition, relative abundance, nesting density, and breeding biology of birds in the Whitefish Station area of the western Mackenzie Delta.

2.0 STUDY AREA

The Whitefish Station area lies on the Beaufort Sea coast midway between the outlet of Moose Channel and the western edge of the Blow River Delta (Fig 1). Geologically, it is a flat delta plain continuous with the remainder of the Mackenzie River Delta, in contrast to the adjacent rolling moraines which form much of the adjacent coastal plain. Drainage is fair to poor, and the vegetation comprises grasses, sedges, and low shrubs, with medium and tall shrubs more common in better drained sites along the distributaries of the Blow River and in sheltered areas such as the base of 20-30 m-high bluffs which form

the south border of the Delta proper. Owing to a southeasward gradient in temperatures, this area has the warmest climate of the entire Yukon coast (mean July temperature 7 C at Komakuk and 11 C at Shingle Point (Burns 1973).

3.0 METHODS

A field camp was established at Whitefish Station during the period 19 June - 3 July 1985. Two types of surveys were made: 1) a general avifaunal survey in which observers simply recorded the species, abundance, and breeding status of birds seen during hikes and boat trips throughout the study area; and 2) intensive censuses and nest searches on specific study plots.

Plots were designed to generate estimates of nesting density for the birds in the area. Six replicate 10 ha plots were established, 5 were 200x200 m and the other 100x1000 m. Because of the difficulty of laying out plots across lakes, a random distribution was impractical. Instead, plots were located in relatively uniform areas devoid of larger lakes, although some bordered larger lakes. Plots were delineated using a compass and surveyor's chain and each was subdivided into 50x50 m grids by 2 rows (1 row for the 100x1000 m plot) of 1 m surveyor's stakes (Fig 2).

Plots were censused by 2-3 observers. Two persons dragged a 50 m rope to flush incubating birds, and the third, if present, walked slightly behind to better locate birds flushed by the rope. Species, age, sex, location, and activity of all birds seen on the plot were recorded on coding sheets and diagrams of the plot. For nests found, species, number of eggs or young, presence of adults, and plot and grid numbers were recorded. A numbered plain tongue depressor was placed 1 m from the nest towards the nearest row of stakes, and an orange tongue depressor indicating the direction and distance to the nest was placed on the centerline of that row of stakes directly opposite the nest.

When hatching date was known but initiation date unknown or vice versa, the missing parameter was estimated using observed clutch size, the normal incubation period for that species (Table 1), and an egg-laying rate of one per day. For sandhill crane and glaucous gull, incubation was assumed to begin with the first egg, and in all other species, with the last egg of the clutch.

Observations of tundra swans, sandhill cranes were excluded from the analysis of breeding bird density because these birds often left the study plots well in advance of a census and were usually associated with known nests. Densities of ducks on the plots were not calculated as they would have been gross underestimates of the true densities in the area (see Discussion). Two large flocks of red-necked phalaropes were also excluded because they were obviously migrants.

4.0 RESULTS

4.1 Nests and Study Plots

We found a total of 206 nests of 16 species. Thirty-eight nests of 12 species were on the 6 study plots (Table 2). Estimated nest densities ranged from 15 nests/km^2 for semipalmated sandpipers (9 nests on plots) to 1.7/km^2 for lesser scaup and others (1 nest on plots). Few other studies in the northern Yukon have involved nest searches on study plots, but the total density of bird nests in this study (62.4/km^2) is comparable to that found in many studies on the Alaska coastal plain (range 45-152/km^2; Burgess 1984). Shorebird nest densities in this study (28.3/km^2) were lower than found in most other studies, with the exception of plots in sedge tussock or wet sedge habitats.

Estimates of breeding density for each species (based on average number of birds per census observed on each study plot) ranged from 1 to 130 birds/km^2 (Table 2), and all species combined were estimated at 311 birds/km^2. Total bird density was slightly higher in the Whitefish Station area than on the Alaska coastal plain or at most other sites on the Yukon coastal plain, primarily due to the presence of large numbers of savannah sparrows. Shorebird density (93/km^2) was lower than the most productive places on the Alaska and Yukon coastal plain (150-300/km^2)(Burgess 1984, Koski 1975a, Spindler et al. 1984, Troy 1985), and higher than densities in the King Point area in 1981 (Dickson 1985).

Estimates of nest and breeding bird density were quite variable due to variation among the 6 plots (Appendices I, II). While shorebirds were the most abundant breeders in the area based on nests found, the common passerine nesters, lapland longspur and savannah sparrow, were the most abundant breeders based on birds observed. Nests of brant, oldsquaw, arctic tern, and arctic loon were found only off the plots. Red-throated loons, green-winged teal, and common snipe probably nested in the study area although we did not find nests (see species accounts).

4.2 Nesting Colonies

We found two large and several smaller islands on which brant and glaucous gulls nested colonially (Fig 1). In total, these colonies accounted for 56 brant and 78 glaucous gull nests, as well as several oldsquaw, 1 tundra swan, and 1 arctic tern nest (Table 3). Brant and glaucous gull nests were interspersed in the colonies, occasionally less than 1 m apart. We visited both of the large islands on 23 June, at which time all nests were in the incubation stage. At the time of the next visit on 3 July many nests in colony 1 were in the process of hatching so we did not visit colony 2.

4.3 Tent Island

We briefly visited Tent Island on 30 June, spending about 2 h walking on the northwestern half. Generally the birds were similar to those on the study plots. One destroyed duck nest (probably oldsquaw) was the only evidence of nesting ducks or geese, although there were scaup, oldsquaws, and other ducks in the ponds. We did find one tundra swan nest and saw a flock of 15 swans which may have started to molt.

4.4 Chronology

The chronology of breeding for nearly all species in our study was similar to, or even earlier than that observed by Campbell (1973) in 1972. May and June were slightly cooler than average in 1972 whereas they were warmer than average in 1985. The snow pack in the beginning of May was much deeper in 1985 than 1972, but warm weather nevertheless eliminated it by the end of May (Table 4).

4.5 Species Accounts

In the following species accounts, abundance is indicated as follows (modified from Kessel and Gibson [1978] and Salter et al. [1980]):

abundant (A): species occurs repeatedly in proper habitats, with available habitat heavily utilized, and/or consistently observed in high numbers;

common (C): occurs in nearly all proper habitats, but some suitable habitat sparsely occupied, and/or observed in large numbers;

fairly common (FC): occurs regularly in only some of suitable habitat and/or observed in substantial numbers;

uncommon (U): occurs regularly in very little of suitable habitat and/or observed in relatively small numbers;

rare (R): species within its normal range, occuring regularly but in very small numbers.

very rare (VR): very few observations and/or species well beyond its normal range. (equivalent to "casual").

Residence status is indicated as follows:

breeding (b): definite evidence of breeding (nest, unfledged young, adults carrying food to young, etc.);
probably breeding (b?): evidence suggests breeding;
permanent resident (pr): some individuals (probably) present year-long;
summer resident (sr): present only seasonally;
summer visitant (sv): present briefly in the summer;
spring or fall migrant (sm, fm, m): present only during migration periods or changing abundance during migration.

Following abundance and residence status, other measures of abundance are given, eg. (14/15, 20, max 50). This indicates the species was seen on 14 of 15 days, an average of 20 was seen per day, and a maximum of 50 seen in any single day.

Red-throated Loon (Gavia stellata). FCbsr (14/15, 3, max 4). A few seen almost every day in ponds throughout the study area. Although we found no nests, there is no doubt several pairs nested.

Arctic Loon (Gavia arctica). Ub?sr (4/15, 1, max 2). Seen on larger ponds or lakes.

Horned Grebe (Podiceps auritus). Rsv. Two seen 30 June.

Tundra Swan (Cygnus columbianus). Absr (14/15, 20, max 50). Nested throughout the study area. For 11 nests, the average clutch size was 3.1 (Table 5). We felt that we found virtually all the nests (10) in a 25-35 km^2 area around the camp. These nests would indicate a density of 0.3-0.4/km^2. One nest hatched on 1 July and at least 3 on 3 July, indicating initiation of nesting 27 May - 1 June. Only the nest on nesting colony 1 was definitely destroyed by a predator. Breeding swans were flying until the time we left, but a flock of 15 on Tent Island on 30 June may have been flightless non-breeders.

Greater White-fronted Goose (Anser albifrons). FCsr (12/15, 21, max 90). Seen primarily flying at low altitude along the coast or feeding in salt marsh areas. No evidence of breeding.

Brant (Branta bernicla). Cbsr (13/15, 18, max 35). 57 nests found, 43 on the 2 large nesting colonies, 7 on smaller islands, and the remainder on a peninsula. Mean clutch size was 3.8 and the most common clutch 4 (Table 5). Ten of 21 nests in colony 1 hatched on or before 4 July; the rest showed no sign of hatching as of 3 July. The earliest definite hatching date was 2 July, but possibly some nests which we found empty on 3 July had hatched several days earlier. Only 1 nest in colony 1 was destroyed by a predator but on the adjacent peninsula (colony 3), 5 of 7 nests were destroyed by an arctic fox shortly before we found them on 23 June. One nest on colony 5 was abandoned between our first and second visits. Both light and dark-bellied morphs of brant were present in the colonies. Brant were rarely seen away from the nesting colonies.

Canada Goose (Branta canadensis). Usv (6/15, 2, max 10). Groups of 2-9 seen in salt marsh with other geese or flying along the coast.

Green-winged Teal (Anas Crecca). Ub?sr (10/15, 2, max 5). One pair probably nested in the vicinity of the field camp.

Mallard (Anas platyrhynchos). Rsr. Seen on only 2 days: 5 on 20 June, 2 on 30 June.

Northern Pintail (Anas acuta). Cbsr (14/15, 30, max 50). Most common dabbling duck in the study area. We found one nest which was initiated 17 June and destroyed between 30 June and 2 July. Males constituted about 95% of the individuals seen.

Northern Shoveler (Anas clypeata). Cbsr (13/15, 7, max 25). Second most common dabbling duck observed. As with northern pintail, males predominated. A single nest with 8 eggs was initiated 12 June.

Gadwall (Anas strepera). FCsr. (6/15, 2, max 12). Most birds were males.

American Wigeon (Anas americana). FCsr. (7/15, 3, max 10).

Canvasback (Aythya valisineria). Rsv. 3 males on 20 June.

Greater/Lesser Scaup (Aythya marila/A. affinis) Cbsr/ Ubsr. (13/15, 19, max 40). The only 2 definitive sightings of lesser scaup were of a single nesting female. About 95% of scaup in flocks were males, although pairs were seen throughout the period. Three greater scaup nests found 21, 28, and 30 June, clutch sizes 6, 8, and the third may have been incomplete with 4 eggs on the first and only visit. One lesser scaup nest 29 June with 5 eggs may also have been an incomplete clutch.

Harlequin Duck (Histrionicus histrionicus). Rsv. 1 male on 24 June.

Oldsquaw (Clangula hyemalis). Cbsr. (15/15, 15, max 40). Oldsquaws were courting vigorously when we arrived, but had all but ceased by the end of June. Larger flocks in the lakes appeared to contain many females, in contrast to the case with most other species. Of 4 nests found, 3 were on nesting islands, and 1 on a peninsula. Two complete clutches contained 6 and 5 eggs. The only known initiation date was 20 June. Two of the nests still contained eggs when last checked while 1 was destroyed and 1 abandoned.

Surf Scoter (Melanitta perspicillata). Usv,m. (3/15). White-winged Scoter (Melanitta deglandi). Usv,m. (2/15). We saw scotors only on or over the adjacent waters of Shoalwater Bay. Only about 15 were seen until the evening of 30 June, when one flock flew over our camp at an altitude of over 300 m. We visited Tent Island by boat that night between 2300 and 0230 h and saw another 5 flocks ranging from 50 to >200 birds flying low over the water, all heading west.

Common goldeneye (Bucephala clangula). Usv. (6/15, 5, max 7).

Bufflehead (Bucephala albeola). Rsv. One female on 30 June.

Red-breasted Merganser (Mergus serrator). Usv. (5/15, 2, max 2).

Northern Harrier (Circus cyaneus). Usv. (3/15, 1, max 1).

Rough-legged Hawk (Buteo lagopus). Rsv. One on 19 June.

Golden Eagle (Aquila chrysaetos). Rsv. (3/15, 1, max 2).

Gyrfalcon (Falco rusticolus). Rsv. (1/15).

Willow Ptarmigan (Lagopus lagopus). Ub?sr. One seen 24 June west of the study area, near the mouth of the Blow River. Probably breeds in shrubby habitats in that area.

Sandhill Crane (Grus canadensis). FCbsr. (14/15, 11, max 30). Two nests found, 1 of 2 eggs found hatching on 21 June which would have been initiated ca. 20 May, and another of 2 eggs found 24 June and abandoned between then and 30

June. Flocks of up to 15 which we saw near the end of June probably were non-breeding birds gathering to molt their flight feathers.

Lesser Golden Plover (Pluvialis dominica). Usv. (4/15, 2, max 6).

Semipalmated Plover (Charadrius semipalmatus). Usv. (2/15).

Lesser Yellowlegs (Tringa flavipes). Usv. (2/15).

Whimbrel (Numenius phaeopus). Usv. (7/15, 2, max 4).

Hudsonian Godwit (Limosa haemastica). Usv. (4/15, 1, max 2).

Semipalmated Sandpiper (Calidris pusilla). Cbsr. (15/15, 15, max 30). Sixteen nests found, 14 with 4 eggs, 1 with 3 eggs, and 1 clutch which may have been incomplete at the last visit. Five nests which could be backdated were initiated 4-18 June and would have hatched 28 June-12 July. This species was still displaying on 19 June but had finished by about 26 June. Most nests were located in areas of shorter, sparser vegetation and relativley dry ground.

Least Sandpiper (Calidris minutilla). Usv. One seen on a gravel bar in the Blow River Delta on 24 June.

Pectoral Sandpiper (Calidris melanatos). Ub?sr,m. (13/15, 14, max 75). A few male displays heard most days, but few birds actually seen until the first flocks of obvious migrants appeared ca. 27 June. No direct evidence of breeding.

Long-billed Dowitcher (Limnodromus scolopaceus). Usv,m. (5/15, 11, max 40). First seen 28 June.

Common Snipe (Capella gallinago). Ub?sr. (13/15, 2, max 2). One or 2 heard winnowing on most days.

Red-necked Phalarope (Phlaropus lobatus). Cbsr,m. (14/15, 48, max 175). Ten-30 per day seen until 27 June when the first post-breeding flocks appeared in lakes and ponds. We found 9 nests between 20 and 29 June, but could not determine the fate or initiation dates of any.

Parasitic Jaeger (Stercorarius parasiticus). FCsr. (8/15, 2, max 5).

Long-tailed Jaeger (Stercorarius longicoudus). Usv. (2/15, 2, max 3).

Mew Gull (Larus canus). Rsv. One adult seen 30 June.

Ring-billed Gull (Larus delawarensis). VRsv. One adult and 1 second-year bird 23 June.

Thayers/Herring Gull (Larus argentatus/L. thayeri). Rsv. (2/15). Occasional gulls of this type were present among the many glaucous gulls in the study area. At the nesting colonies on 3 July we observed one Thayer's/herring gull and at least two birds with wingtips indicative of a hybrid between those and

glaucous gulls.

Glaucous Gull (Larus hyperboreus). Cbsr. (14/15, 25, max 100). We found 79 nests of this species, only one of which was on a plot; the majority (69) were on the 2 largest nesting colonies (Table 3) and the rest on smaller islands or shorelines of small lakes. Mean clutch size was 2.8 and the most common clutch 3 (Table 5). The distribution of clutch sizes differed significantly between the two large islands, colony 2 having a greater proportion of 3-egg clutches (38/41 on colony 2 vs. 18/27 on colony 1). Of the nests on colony 1, 17 had hatched or were hatching as of our visit on 3 July while 9 showed no sign of hatching. The earliest definite hatching date was 29 June, and the peak probably 29-30 June. The peak of nest initiation would have been ca. 1-2 June.

Arctic Tern (Sterna paradisaea). Ubsr. (12/15, 3, max 4). One nest found on colony 1.

Barn Swallow (Hirundo rustica). Rsv. One seen 19 and 26 June.

Common Raven (Corvus corax). FCpr. (13/15, 2, max 4).

Yellow Warbler (Dendroica petechia). FCb?sr. At least 10 heard singing in tall shrubs along the Blow River 24 June. Probably breeds in shrubby areas at the base of bluffs east of the Blow River as well.

American Tree Sparrow (Spizella arborea). FCb?sr. One appeared to flush from a nest in shrubs at base of bluffs bordering the delta, 23 June. Distribution probably similar to yellow warbler.

Savannah Sparrow (Passerculus sandwichensis). Absr. (14/15, 16, max 20). Ten nests found, mean clutch size 4.8. Nests were initiated 2-11+ June and hatched 18-28+ June.

Fox Sparrow (Passerella illiaca). FCb?sr. Four heard singing in tall shrubs along Blow River, 24 June.

White-crowned Sparrow (Zonotrichia leuchophrys). FCb?sr. Three heard singing in tall shrubs along Blow River, 24 June.

Lapland Longspur (Calcarius lapponicus). Absr. (14/15, 16, max 25). Eight nests found, mean clutch size 4.2. Nests were initiated 29 May-15+ June and hatched 15 June-1+ July.

Common/Hoary Redpoll (Carduelis flammea/hornemanni). FCbsr. (14/15, 19, max 50). Flocks commonly seen, but most may have been non-breeding. One nest found.

5.0 DISCUSSION

5.1 Nesting Populations

Campbell (1973) studied the breeding birds of the Moose Channel area, just east of Whitefish Station on the Mackenzie Delta. Although his methods were slightly different than those of this study, there are a few notable

differences in the results: Campbell found arctic and red-throated loons and arctic terns much more common in the Moose Channel area. A number of species bred there in low numbers but apparently do not breed in the Whitefish Station area (white-fronted goose, willow ptarmigan, least sandpiper, Hudsonian godwit, parasitic jaeger, long-tailed jaeger). On the other hand, brant nest at Whitefish Station, and semipalmated sandpipers and lapland longspurs are much more common there than at Moose Channel. These differences are probably attributable to a relative scarcity of shrubs and ponds in the Whitefish Station area as compared to the Moose Channel study area.

Both the Moose Channel and Whitefish Station areas lack many of the tundra-nesting shorebirds found along much of the remaining Beaufort coast, including parts of the Mackenzie Delta. Lesser golden plover, pectoral sandpiper, Baird's sandpiper, stilt sandpiper, buff-breasted sandpiper, and red phalarope are rarely seen on the western part of the Delta during the breeding season, but breed in adjacent areas to the east and west.

Our estimates of nesting density (based on actual nests) are likely low for most species because not all nests on plots were found. This was especially true for passerine birds whose nests were difficult to find (savannah sparrow, lapland longspur). These were the most abundant species based on birds observed on plots, but more frequent censuses would be required to either: 1) find most of their nests; or 2) adequately map the territories of singing males. Both would require censusing to start very early in the breeding season - perhaps as early as the end of May.

The location of our 6 plots probably compensated somewhat for this underestimation because they were deliberately placed so as to include very little water area. If they had been randomly placed, several would have undoubtedly fallen on major lakes. Because their was relatively little water on the plots, it was not appropriate to estimate the breeding duck population based on birds observed on the plots. There were fairly large numbers of ducks present on waterbodies in the study area, but because most of these were males, and nest densities appeared to be low, we conclude that the majority of ducks in the area were not breeding and that the number of nests found is the best measure of the true breeding population. The nest data for nesting brant and glaucous gulls are virtually total counts because of their colonial nature and fairly predictable nesting sites. Those two species lend themselves to further population monitoring.

5.2 Disturbance

Only two breeding species appear to be vulnerable to disturbance in this area. We found, as did Campbell (1973), that sandhill cranes show very little nest fidelity during the incubation period and are very likely to desert after only a few visits. Tundra swans are also very sensitive to disturbance, but return to their nests more quickly and are far less likely to desert. These two species are difficult to deal with if they happen to be nesting on a study plot because they can see a long way and may not return to their nests until people completely leave the plot. The nesting colonies are also vulnerable to disturbance. We felt that both brant and glaucous gulls were quick to return to their nests after our visits, but repeated disruptions during incubation would likely cause increased predation of nests by the gulls. At hatching time disturbance can cause brant to prematurely attempt to lead their broods from the nest and similarly can cause unattended young glaucous gulls to flee the

area of their nests; both of these situations can increase mortality, especially in bad weather. In any study of these birds it would be desirable to minimize the number and duration of visits to the large colonies.

5.3 Recommendations for Further Study

The most useful result of this inventory is the updated information on nesting colonies. These appear to be the nesting places of nearly all of the Yukon's breeding brant, and they have a significant number of glaucous gulls compared to the remainder of the Yukon Beaufort Sea coast. The dense concentrations of nesting birds on these islands makes them ideal for study, for example monitoring population status and chronology of nesting. Apparently there are other colonies of terns, gulls, and oldsquaws on adjacent parts of the Delta (Campbell 1973). It would be useful and relatively inexpensive to make a complete inventory of these nesting colonies over a large part of the Mackenzie Delta, if this has not already been done. The inventory could be accomplished in several phases: 1) literature search, interview people previously involved in the area, identify potential sites on air photos and maps; 2) fixed-wing aerial surveys to eliminate sites without colonies; 3) inventory of each remaining site with helicopter and portable boat.

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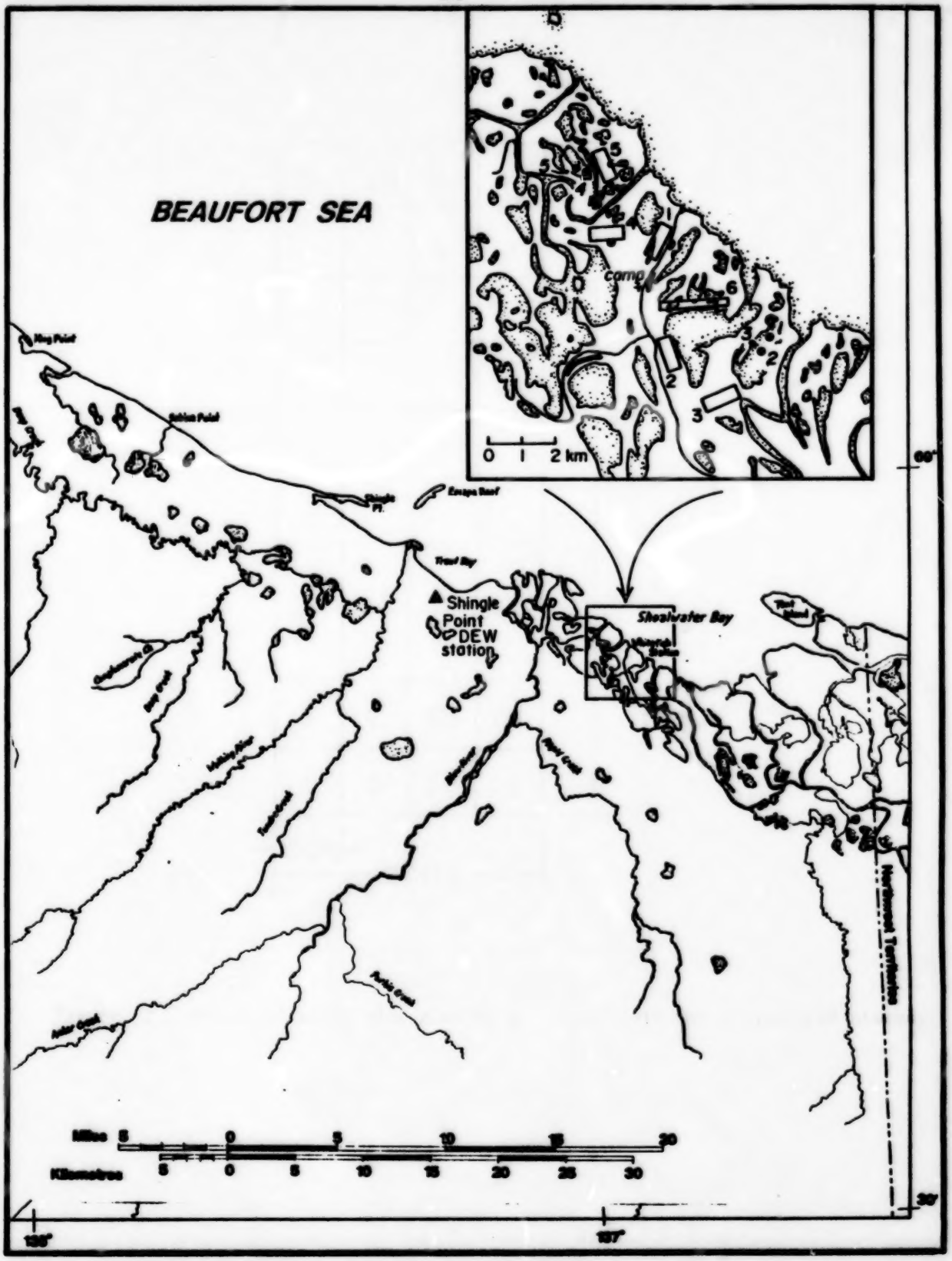

Figure 1. The Whitefish Station Study area showing location of the field camp (+), study plots, and nesting colonies (solid dots).

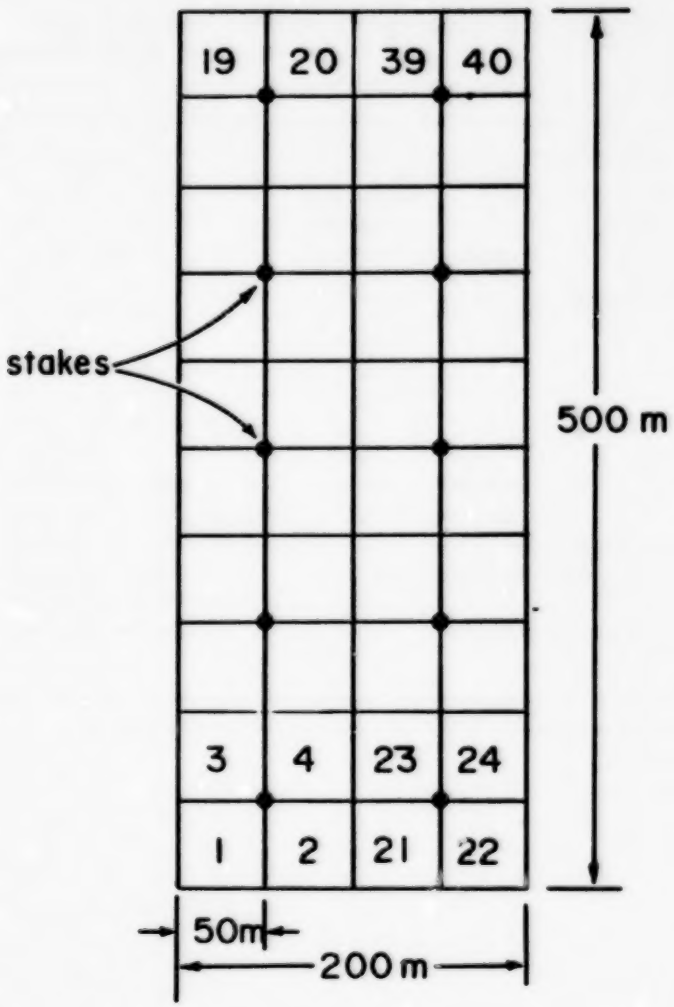

Figure 2. Detail of study plot showing grids and location of numbered stakes.

Table 1. Incubation periods used to calculate nest initiation and hatching dates of bird species.

Species	Incubation Period (days)	Source
Tundra Swan	31	Bellrose 1976
Brant	24	"
Northern Pintail	23	"
Northern Shoveler	24	"
Greater/Lesser Scaup	25	"
Oldsquaw	24	"
Sandhill Crane	30	Godfrey 1966
Semipalmated Sandpiper	20	Norton 1972
Red-necked Phalarope	22	Jehl and Hussell 1966
Glaucous Gull	28	Godfrey 1966
Savannah Sparrow	12	"
Lapland Longspur	12	Jehl and Hussell 1966

Table 2. Numbers of bird nests found on and off study plots in the Whitefish Station area, and estimated densities of nests and birds based on data from study plots (total area 0.6 km^2).

Species	Nests Found		Nests/km^2		Birds/km^2	
	Off Plots	On Plots	On Plots	SD[1]	On Plots	SD[1]
Arctic Loon	1	0	0	0	NC[2]	
Tundra Swan	10	1	1.7	4.0	NC	
Brant	57	0	0	0	NC	
Northern Pintail	0	1	1.7	4.0	NC	
Northern Shoveler	0	1	1.7	4.0	NC	
Greater Scaup	1	2	3.3	8.1	NC	
Lesser Scaup	0	1	1.7	4.0	NC	
Oldsquaw	4	0	0	0	NC	
Total Ducks	5	5	8.3	20.1	NC	
Sandhill Crane	0	2	3.3	8.1	NC	
Semipalmated Sandpiper	7	9	15.0	22.5	50.8	43.8
Pectoral Sandpiper	0	0	0		9.2	15.6
Common Snipe	0	0	0		5.0	6.3
Red-necked Phalarope	1	8	13.3	15.0	28.3	29.7
Total Shorebirds	8	17	28.3	37.5	93.4	95.4
Glaucous Gull	78	1	1.7	4.0	0.8	2.0
Arctic Tern	1	0	0	0	0	
Savannah Sparrow	5	5	8.3	4.0	130.0	40.3
Lapland Longspur	3	6	10.0	11.1	67.5	15.7
Redpoll sp.	0	1	1.7	4.0	14.2	23.7
Total Passerines	8	12	20.0	19.1	211.7	79.7
Totals	168	38	61.7	88.7	311.7	191.1

[1] Standard Deviation
[2] Not Calculated (see methods)

Table 3. Species composition of nesting colonies in the Whitefish Station area. Colony numbers refer to locations shown in Fig. 1.

Species	Colony Number 1	2	3	4	5	Total
Glaucous Gull	27	42	2	1	6	78
Arctic Tern	1					1
Brant	21	22	7	3	3	56
Oldsquaw	1	1			1	3
Tundra Swan	1					1
Totals	51	65	9	4	10	139

Table 4. Weather conditions during spring 1972 and 1985 as measured at the Shingle Point DEW line station.

Parameter	Year	April	May	June
Temperature (C)				
Mean Daily Maximum	1972		-2.1	9.0
	1985		1.7	10.1
	20 yr mean		-1.0	9.5
Number of Days with				
Max Temp. > 18°C	1972		0	2
	1985		1	7
	20 yr mean		NA	4
Snow Depth on Ground				
at Month end (cm)	1972	23	T	0
	1985	41	T	0
	20 yr mean	23	4	T

Table 5. Frequency distribution of clutch sizes[1] of brant, glaucous gull, and tundra swan nests in the Whitefish Station area, 1985.

	Clutch Size					
Species	1	2	3	4	5	6
Brant	0	6	11	21	12	1
Glaucous Gull	2	12	65	0	0	0
Tundra Swan	1	1	5	4	0	0

[1] Clutch size is here defined as the maximum number of eggs observed on any visit to the nest. It is unlikely that any clutches of these species were incomplete at the time of the study (see species accounts).

Appendix I. Nests found on six study plots in the Whitefish Station area.

Species	Plot No. 1	2	3	4	5	6	Total
Tundra Swan				1			1
Northern Pintail				1			1
Northern Shoveler	1						1
Greater Scaup		2					2
Lesser Scaup					1		1
Sandhill Crane		1		1			2
Semipalmated Sandpiper	6		1	1		1	9
Red-necked Phalarope	3			2	3		8
Glaucous Gull				1			1
Savannah Sparrow	1		1	1	1	1	5
Lapland Longspur	3	1		1		1	6
Redpoll Sp.		1					1
Totals	14	5	2	9	5	3	38

Appendix II. Birds recorded during censuses of 6 study plots in the Whitefish Station area.

Species	Plot 1	Plot 2	Plot 3	Plot 4		Plot 5		Plot 6	
	28 June[1]	28 June[1]	28 June[1]	24 June	29 June	25 June	29 June	27 June	30 June
Northern Shoveler	1								
Greater Scaup		1							
Lesser Scaup							1		
Oldsquaw					2				
Semipalmated Sandpiper	9		2	5	5	5	1	10	13
Pectoral Sandpiper				2		1		2	6
Common Snipe			1		1	1	2		
Red-necked Phalarope	5			6	7	8	2	10(41)[2]	(125)[2]
Glaucous Gull					1				
Savannah Sparrow	13	17	17	9	16	17	8		7
Lapland Longspur	7	5	7	6	7	8	3	7	12
Redpoll sp.	6	2				1			
Totals	41	25	27	28	39	41	17	29	38

[1] Number of birds not calculated during initial census of plots 1 (20 June), 2 (21 June), and 3 (21 June).

[2] Numbers in parentheses are excluded from the analysis of bird density (see Methods).